

What is claimed is:

CLAIMS

1. A print cartridge for use in a printing system, the print cartridge having at least two
5 distinct rates of ink usage corresponding to at least two types of printing performed by the
printing system, the print cartridge comprising:

an ink replenishment path for selectively providing at least two flow rates into the
print cartridge; and

10 a controller for selecting a particular flow rate based on the type of printing being
performed by the printing system.

2. The print cartridge of claim 1, further comprising:

15 a removal path operated by the controller in response to gauge pressure within the
print cartridge, the removal path for extracting excess air and ink from within the print
cartridge to regulate the gauge pressure to a predetermined range suitable for the particular
types of printing performed by the printing system.

3. A print cartridge for selectively depositing fluid on media, the print cartridge having a
reservoir containing a quantity of fluid, the print cartridge comprising:

20 a first valve for selectively defining a first fluid path between a fluid source and the
reservoir;

a second valve for selectively defining a second fluid path, different from the first
fluid path, between the fluid source and the reservoir;

25 a controller linked to each of said first and said second valves; and

wherein said controller is responsive to gauge pressure in said reservoir for
modulating each of said first and said second valves to provide fluid flow in the first and the
second fluid paths, respectively, into the reservoir.

4. The print cartridge of claim 3, further comprising:

30 an inlet; and

a third valve disposed in a third path between said inlet and the reservoir;

wherein said controller is further responsive to gauge pressure in said reservoir for modulating said third regulator to provide additional fluid flow in the third path with the reservoir.

5 5. The print cartridge of claim 4, wherein said inlet is coupled to a vacuum.

6. The print cartridge of claim 5, further comprising a second reservoir containing said vacuum, wherein the second reservoir is disposed between said inlet and said third valve.

10 7. The print cartridge of claim 6, wherein said second reservoir is capable of being removed and replaced on the print cartridge.

8. The print cartridge of claim 5, wherein said controller is responsive to gauge pressure in the reservoir for modulating said third valve to evacuate air from the reservoir.

15 9. The print cartridge of claim 3 wherein said fluid source is capable of being removed and replaced on the print cartridge.

10. The print cartridge of claim 2 wherein said fluid source is integral to the print cartridge.

20 11. The print cartridge of claim 10, wherein said fluid source further comprises a source inlet wherein said fluid source is capable of being replenished with a quantity of fluid through said source inlet.

25 12. The print cartridge of claim 10, wherein said fluid source further comprises a source inlet wherein said fluid source is capable of being pressurized through said source inlet.

13. A media printing apparatus comprising at least one print cartridge of claim 1.

30 14. A print cartridge for selectively depositing fluid on media, the print cartridge having a first inlet and a reservoir containing a quantity of fluid, the print cartridge comprising:

a first regulator, disposed in a first path between the first inlet and the reservoir;

a second inlet;

a second regulator disposed in a second path between said second inlet and the reservoir; and

5 a controller linked to said first regulator and said second regulator;

wherein the reservoir is capable of having a pressure sensed by said controller, and wherein said controller is capable of modulating said first regulator and said second regulator to provide adjustment of the pressure in the reservoir.

10 15. The print cartridge of claim 14, further comprising a third regulator, disposed in a third path between the first inlet and the reservoir wherein said first path is distinct from said third path and wherein said controller is capable of modulating said first regulator and said second regulator to provide multiple levels of fluid flow into said reservoir in response to the pressure sensed by said controller.

15 16. The print cartridge of claim 14, wherein said second inlet is coupled to a vacuum.

17. The print cartridge of claim 16, further comprising a second reservoir containing said vacuum, wherein said second reservoir is disposed between said second inlet and said second 20 regulator.

18. The print cartridge of claim 17, wherein said second reservoir is capable of being removed and replaced on the print cartridge.

25 19. The print cartridge of claim 16, wherein said controller is capable of modulating said second regulator to evacuate air from the reservoir.

20. The print cartridge of claim 14, further comprising:

a fluid source capable of being fluidically coupled to said first inlet, and

30 wherein said fluid source is capable of being removed and replaced on the print cartridge.

21. The print cartridge of claim 14, further comprising:

a fluid source fluidically coupled to said first inlet; and

wherein said fluid source is integral to the print cartridge.

5 22. The print cartridge of claim 21, wherein said fluid source further comprises a source inlet wherein said fluid source is capable of being replenished with a quantity of fluid through said source inlet.

10 23. The print cartridge of claim 21, wherein said fluid source further comprises a source inlet wherein said fluid source is capable of being pressurized through said source inlet.

24. A printing apparatus comprising at least one print cartridge of claim 14.

15 25. An apparatus for maintaining pressure regulation in a reservoir containing a quantity of fluid, the apparatus comprising:

a first valve having an input and an output coupled to the reservoir;

at least one additional valve having an input and an output coupled to the reservoir;

and

a controller capable of modulating the first valve and the at least one additional valve

20 based on the gauge pressure in the reservoir;

wherein the valve and the at least one additional valve are capable of providing

multiple levels of fluid flows into the reservoir.

25 26. The apparatus of claim 25, further comprising an third valve having an input and an output coupled to the reservoir, said third valve capable of being modulated by said controller based on the gauge pressure in the reservoir, wherein said third valve is capable of evacuating air from the reservoir.

30 27. A print cartridge comprising the apparatus of claim 26, the print cartridge further comprising:

a vacuum source couple to the input of the third valve;

PRINT CARTRIDGE APPARATUS

a fluid source coupled to the input of the first valve and the input of the at least one additional valve; and

a printhead capable of reducing the gauge pressure in the reservoir by ejecting portions of the quantity of fluid;

5 wherein the apparatus is capable of counteracting the reduction of gauge pressure.

28. A print cartridge comprising the apparatus of claim 25, the print cartridge further comprising:

a fluid source coupled to the input of the first valve and the input of the at least one 10 additional valve; and

a printhead capable of reducing the gauge pressure in the reservoir by ejecting portions of the quantity of fluid;

wherein the apparatus is capable of counteracting the reduction of gauge pressure.

15 29. An apparatus for maintaining pressure regulation in a reservoir containing a quantity of fluid under pressure, the apparatus comprising:

a first regulator capable of modulating a first fluid flow into the reservoir;

a second regulator capable of modulating a second fluid flow into the reservoir, the first fluid flow distinct from the second fluid flow; and

20 a controller capable of modulating the first fluid flow and the second fluid flow based on the gauge pressure in the reservoir;

wherein the first fluid flow and the second fluid flow are capable of providing multiple levels of fluid flow into the reservoir.

25 30. A print cartridge comprising the apparatus of claim 29, the print cartridge further comprising:

a fluid source coupled to the first regulator and the second regulator; and

a printhead capable of reducing the gauge pressure in the reservoir by ejecting portions of the quantity of fluid;

30 wherein the apparatus is capable of counteracting the reduction of gauge pressure.

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31. An apparatus for maintaining pressure regulation in a reservoir containing a quantity of fluid under pressure, the apparatus comprising:

a first regulator capable of modulating a first fluid flow into the reservoir;

a second regulator capable of modulating an air flow from the reservoir; and

5 a controller capable of modulating the first fluid flow and the air flow based on the gauge pressure in the reservoir;

wherein the gas flow is capable of evacuating air from the reservoir.

32. The apparatus of claim 31, further comprising a third regulator capable of modulating a second fluid flow into the reservoir, the second fluid flow distinct from the first fluid flow and wherein the controller further is capable of modulating the second fluid flow based on the gauge pressure in the reservoir wherein the first fluid flow and the second fluid flow are capable of providing multiple levels of fluid flow into the reservoir.

15 33. A print cartridge comprising the apparatus of claim 32, the print cartridge further comprising:

a vacuum source coupled to the second regulator;

a fluid source coupled to first regulator and the third regulator; and

a printhead capable of reducing the gauge pressure in the reservoir by ejecting

20 portions of the quantity of fluid;

wherein the apparatus is capable of counteracting the reduction of gauge pressure.

34. A print cartridge comprising the apparatus of claim 31, the print cartridge further comprising:

25 a vacuum source coupled to the second regulator;

a fluid source coupled to first regulator; and

a printhead capable of reducing the gauge pressure in the reservoir by ejecting portions of the quantity of fluid;

wherein the apparatus is capable of counteracting the reduction of gauge pressure.

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35. A method for regulating pressure in a print cartridge, comprising the steps of:

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sensing the pressure;
activating a first flow valve when the pressure is less than a first predetermined limit;
deactivating the first flow valve when the pressure is not less than the first predetermined limit;

10 36. The method of claim 35, further comprising the steps of:
activating a vacuum valve if the pressure is more than a third predetermined limit; and
deactivating the vacuum valve if the pressure is not more than the third predetermined limit.

15 37. A method for regulating pressure in a print cartridge, comprising the steps of:
sensing the pressure;
activating a first flow valve when the pressure is less than a first predetermined limit;
deactivating the first flow valve when the pressure is not less than a first predetermined limit;

20 activating a vacuum valve if the pressure is more than a second predetermined limit;
deactivating the vacuum valve if the pressure is not more than a second predetermined limit;

25 38. A method for regulating pressure in a print cartridge having a fluid source and a local reservoir, the method comprising the steps of:
sensing the pressure;
issuing a first flow of fluid into the local reservoir from the fluid source when the pressure is less than a first predetermined limit; and
issuing a second flow of fluid into the local reservoir from the fluid source when the 30 pressure is less than a second predetermined limit.

39. The method of claim 38, further comprising the step of evacuating air from the local reservoir when the pressure is more than a third predetermined limit.

40. The method of claim 38, wherein said first flow of fluid has a volume flow rate, and
5 said second flow of fluid has a volume flow rate equal to said volume flow rate of said first flow of fluid.

41. The method of claim 38, wherein said first flow of fluid has a volume flow rate, and
said second flow of fluid has a volume flow rate not equal to said volume flow rate of said
10 first flow of fluid.

42. A method for regulating pressure in a print cartridge having a fluid source and a local reservoir, the method comprising the steps of:

sensing the pressure;

15 issuing a first flow of fluid into the local reservoir from the fluid source when the pressure is less than a first predetermined limit; and

evacuating air from the local reservoir when the pressure is more than a second predetermined limit.

20 43. A method for recharging a print cartridge having the method for regulating pressure as in claim 42, the method comprising the steps of:

injecting fluid into a fluid source within the print cartridge; and

withdrawning air from a vacuum reservoir within the print cartridge.